F-6224

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | |
|---|---|---|
| Applicant | : | Gerold MAHLER et al. |
| Serial No. | : | 09/319,126 |
| Filed | : | June 1, 1999 |
| For | : | METHOD FOR STOCKING AND PRESERVING GREEN ROUND WOOD AND SAWN TIMBER |
| Group Art Unit | : | Not yet known |
| Examiner | : | Not yet known |

**Express Mail mailing label No. EM 523 724 978 US**
**Date of Deposit: August 23, 1999**

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Delenia A. Reyes

Assistant Commissioner for Patents
Washington, D.C. 20231

RESPONSE TO FORM PCT/DO/EO/905

10/04/1999 WCLAYBRO 00000015 101250 09319126

01 FC:115 Sir:110.00 CH
02 FC:154 130.00 CH

In response to the Form PCT/DO/EO/905 dated July 6, 1999, submitted herewith is the executed declaration.

Please charge the $130.00 government fee for late filing of the declaration to Deposit Account No. 10-1250.

A one month extension of time is hereby requested for which please charge the government fee of $110.00 to Deposit Account No. 10-1250. Please charge any fee deficiency or credit any overpayment to the same deposit account.

Also submitted herewith is a copy of Form PCT/DO/EO/905 to be returned with the response.

Respectfully submitted,

JORDAN AND HAMBURG LLP

By _____
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A/D 581.40 09/319126

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412 Rec'd PCT/PTO 0 1 JUN 1999

Docket No. F-6224
Date June 1, 1999

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Delenia A. Reyes
(Typed or printed name of person mailing paper or fee)

Delenia A. Reyes
(Signature of person mailing paper or fee)

THE ASSISTANT COMMISSIONER FOR PATENTS
Washington, D. C. 20231

[ ] **ATTN: BOX PATENT APPLICATION**
[ X ] **ATTN: BOX PCT**

[ ] **THIS IS THE NATIONAL STAGE OF PCT/DE97/02966 FILED December 19, 1997**

Sir:

Transmitted herewith for filing is the [ X ] Utility [ ] Design patent application of:

Inventor/Application Identifier: **Gerold MAHLER et al.**

For: **METHOD FOR STOCKING AND PRESERVING GREEN ROUND WOOD AND SAWN TIMBER**

Enclosed are:

[ X ] 3 sheets of drawings ( [ X ] formal [ ] informal size A4 ).
[ X ] 8 pages of specification, including claims and abstract.
[ X ] 11 total pages
[ ] Combined Declaration/Power of Attorney
  [ ] Newly executed
  [ ] Copy from prior application
  [ ] Inventors deleted; see attached statement
  [ X ] Inventor Information Sheet
[ ] Incorporation By Reference. The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein

[ ] Sequence Listing
  [ ] Computer Readable Copy
  [ ] Paper copy
  [ ] The undersigned hereby affirms that the content of the paper and computer readable copies of the Sequence Listing are the same.

CLAIMS FILED

| For | Number Filed | Number Extra | | Rate | Basic Fee **$840.00** |
|---|---|---|---|---|---|
| Total Claims | 28 | 8 | (over 20) x | $18.00 | **$144.00** |
| Independent Claims | 1 | | (over 3) x | $78.00 | |
| [ X ] Multiple Dependent Claim | | | | $260.00 | **$260.00** |
| [ ] Reduce by 50% for Small Entity | | | | | |
| [ ] Foreign Language Filing Fee | | | | $130.00 | |
| | | | | TOTAL FILING FEE | **$1,244.00** |

[ X ] Please charge Deposit Account No. 10-1250 in the amount of **$1,244.00**.
A duplicate copy of this sheet is attached.

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[ X ] Preliminary Amendment

[ ] Assignment to _____.

[ ] Assignment is of record in prior application Serial No. _____.

[ ] Assignment Recordation Form Cover Sheet.

[ ] Charge $40.00 to Deposit Account No. 10-1250 for recording Assignment.

[ ] Information Disclosure Statement and/or Information Disclosure Citation

[ ] English translation

[ ] Small Entity Declaration
[ ] filed herewith
[ ] filed in prior application and status is still proper and desired.

[ ] Applicant hereby claims the benefit of the filing date of the following provisional application(s) under the provisions of 35 USC 119.

[ X ] Applicant hereby claims the benefit of the filing date of the following applications under the provisions of 35 USC 119 of which certified copies [ ] will follow [ ] are enclosed [ X ] have been filed in the International Bureau [ ] were filed in prior application No. _____ .

**German Patent Appln. No. 196 52 951.4 filed December 19, 1996.**

[ ] This is a [ ]continuation [ ]divisional [ ]continuation-in-part of prior application Serial No. _____.

[ ] Cancel in this application original claims _____ of the prior application before calculating the filing fee.

[ ] Amend the specification by inserting before the first line the sentence:
--This is a [ ] continuation, [ ] division, [ ] continuation-in-part, of application Serial No. , filed . --

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F-6224

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Gerold MAHLER et al.

Serial No. : Not yet known (U.S. National Stage of PCT/DE97/02966 filed December 19, 1997)

Filed : Concurrently herewith

For : METHOD FOR STOCKING AND PRESERVING GREEN ROUND WOOD AND SAWN TIMBER

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Preliminary to examination, please amend this application as follows:

IN THE SPECIFICATION:

Page 2, line 5, delete "AFZ 19/1992" and substitute therefor --Mahler, G.:

Konservierung von Holz mit Schutzgas (Preservation of Wood Using

Protective Gas), AFZ 47 (1992) 19 --;

line 22, after "from" insert --respiratory processes of wood cells that are still

alive--;

line 23, change "the" to --, and-- and delete ", as well as respiratory processes

of wood cells still alive";

after line 25, insert the following as a new paragraph,

--The airtight cover ensures that, on the one hand, no oxygen can enter from

the exterior and, on the other hand, no carbon dioxide can exit from the cover.--;

line 26, delete "AFZ 19/1992" and substitute therefor --Mahler, G.: Konservierung von Holz mit Schutzgas (Preservation of Wood Using Protective Gas), AFZ 47 (1992) 19--.

Page 3, delete lines 8 and 9.

IN THE CLAIMS:

Cancel claim 1 and substitute therefor the following claim:

--15. Method for preservation storage of green round wood and sawn timber in which green round wood or sawn timber is stocked under a cover, whereby respiratory and fermentation processes by fungi, bacteria, and respiratory processes of wood cells that are still alive are promoted characterized in that green round wood or sawn timber is stocked under an absolutely air-tight and light-tight cover and thereby the oxygen content inside the cover is less than 0.1 vol.-% after an adjustment period of 3-10 days during the entire storage time, and the $CO_2$ content is higher than 21 and up to 40 vol.-%, which to a great extent, prevents the growth of wood-destroying fungi.--

Cancel claim 2.

Claim 3, line 1, change "1 or 2" to --15--.

Claim 4, line 1, change "1 to 3" to --15--.

Claim 5, line 1, change "1 to 4" to --15--.

Claim 6, line 1, change "1" to --15-- and delete "single or".

Claim 10, line 1, change "5 and 6" to -- 15, 3, 4, 5 or 6--.

Claim 11, line 1, change "4 to 10" to --15, 3, 4, 5 or 6--.

REMARKS

This conforms the application to the amendment which was filed in the counterpart PCT application, except that a discussion of U.S. patent 2,617,202 has not been inserted as this is neither customary nor permissible under U.S. practice as it would be considered new matter.

Respectfully submitted,

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**Method for stocking and preserving green round wood and sawn timber**

The invention relates to a method for stocking and preserving green round wood and sawn timber, of both softwood and hardwood, over long periods without loss of quality.

Conventional general preserving methods concern mainly food which is sterilized by heating in the absence of air (bottling, canning), or fumigated in dry condition with carbon dioxide (protection of grain from pests), or gassed with protective gases having special compositions (storing and ripening of fruit in a nitrogen/carbon dioxide atmosphere), or cleared from insects under pure nitrogen (restoration of wood articles whose pigments would be attacked by carbon dioxide).

Methods used so far for preserving green round wood are based on storage in water or sprinkling with water. A wood moisture content of over 100% is aimed at in order to prevent fungal growth. Drawbacks are the high water consumption and the ground-water pollution due to wood substances, in connection with different moisture content in the interior of the wood stack, which results in fungal attack (Armillariella species).

Further, round wood and sawn timber can be preserved for a time using insecticides and fungicides. The application of pesticides involves endangering nature and mankind.

A safe method of preservation is to convert and season the wood as soon as possible. This, however, demands extensive conversion and seasoning capacities to be kept in reserve, in order to be capable of quickly processing large quantities of round wood (wind-fallen wood and other problems).

Also known are attempts to preserve green round wood in dry stacks. This method, however, involves high risks of fungal and insect attacks.

From DE-OS 28 57 355 and DE-OS 34 34 551, methods are known of influencing the wood properties by means of fungal cultures.

According to DE-OS 28 57 355, a method is known of microbiologically modifying softwood using micro-organisms. These micro-organisms selectively modify the softwood whereby the temperature, the moisture content of the wood, the $O_2$ content and the $CO_2$ content are controlled in due consideration of the micro-organisms.

In DE-OS 34 34 551, the round wood is deliberately discoloured by treatment with wood-destroying fungi. Discoloration occurs at those places where the fungus culture has been applied. Also the application of several fungus cultures is described which is associated with a beneficial boundary layer formation.

In the paper AFZ 19/1992, pp. 1024–1025, experiments are reported to preserve wood using a protective gas. In these experiments wood with standardized dimensions was wrapped in silo films. The stacks were fumigated with both nitrogen and carbon dioxide; in each case, the threefold gas volume compared to the wood volume was required. Thereby the oxygen content was reduced to 4–5 % and this content maintained over a longer period of time (more than 6 months). After opening of the stack a fungal coating was found on the wood that is assumed to be an antagonist, which indicates that an attack from wood-destroying fungi can be prevented by the promotion of antagonistic fungi.
Disadvantages are the fumigating demand described and the relatively high residual oxygen content.

It is the objective of this invention to develop a method that enables to stock green round wood or sawn timber of all wood species over a longer period of time without deterioration of quality and strength properties without previously having the wood sterilized, moistened, dried or treated with special protective gases.

The problem is solved using features given by Claim 1. The subclaims present advantageous developments of the invention.

Initially, it is certainly surprising that humid, non-debarked wood is not going mouldy and not rotting under a low-exchange atmosphere. Essential to the invention, however, is that resulting from the metabolic processes of fungi, bacteria, as well as respiratory processes of wood cells still alive which have been fed into the covering through the green round wood, or sawn timber, respectively, a virtually oxygen-free atmosphere, enriched with carbon dioxide, is produced.

Contrary to the interpretation in AFZ 19/1992, pp. 1024–1025, it is not the action of the fungal antagonists which is decisive to prevent wood-destroying fungi from growth. It is rather the very low oxygen content of less than 0.1 vol.-% that is essential for permanent storage possibility.

This low oxygen content is achieved by the fact that after the respiratory processes as in fruit storing in which $CO_2$ and $H_2O$ are released and which end with the consumption of the $O_2$, another cycle starts. In this cycle, fermentation processes occur in that additional $CO_2$ is set free so that the $CO_2$ content further rises.

The initiation of fermentation processes is another substantial advantage of the invention, compared to fruit storage. No degradation of cellulose or lignin takes place while only readily soluble sugars are degradated. Thus the strength of the round wood or timber, respectively, is remained.

The biotechnological process started after the sealing from air can be accelerated by minimization of the volume of the air within the cover.

In order to produce sealing from air, covering, advantageously a plastic film with a high diffusion resistance, is employed. To reduce the danger of leakage the film can be used in double layer. The benefit of a flexible covering consists in that the volume of the air can be minimized (by suction until the film tightly wraps the stack of wood or timber).

Sealing from air can also be obtained in purpose-prepared storehouses, containers, cargo holds, lined pits, silos, or mining tunnels.

After any short-time opening of the air-tight covering to take out some wood, or timber, respectively, the virtually oxygen-free atmosphere after re-sealing reproduces within a few days. The micro-organisms are able, independent of the time of the year, to reproduce those conditions that are favourable for them.
Additionally, $CO_2$ stored in the wood as a porous body and solved in the water bonded in the wood, can again be released to produce a new gas balance.

In film storage, sealing from air of the wood or timber stacks, in case of valuable (veneer) wood also of individual trunks, is achieved by a double weld at the enveloping film, or by gluing, respectively, or by clamping of the films webs straight lying on top of each other by means of strips of wood around which the film is tightly wrapped and secured with clips from unwinding.

The essential advantage of the method according to the invention consists in that the preservation storage needs no additional fumigation.

In the following, further details of the invention will be disclosed by several examples of embodiment. By means of the accompanying drawings it is shown by:

Fig. 1 an arrangement of several round logs with welded, or bonded, respectively, double film encapsulation

Fig. 2 an arrangement of one round log with welded, or bonded, respectively, double film encapsulation

Fig. 3 a clamping device at the film edges

Fig. 4 a diagram showing the gas development during storage under sealing from air

Fig. 5 a diagram showing the bending strength during the storage process after storing under oxygen withdrawal with zero sample and DIN value.

Example of embodiment 1

Double-layered dualene films were spread on a plane surface and 30 m³ of non-debarked spruce, diameter classes 15–25 cm, were placed on them. Two measuring flexible tubes were laid out in the stack and attached to the film using bulkhead fittings. According to Fig. 1, the projecting film was then drawn over the stack and both films–separate from each other–welded by a double weld seam. After about 3 days in summer, about 10 days in winter, the oxygen content reduces to under 0.1 %. The carbon dioxide content levels off at about 40 % (see Fig. 4). After a storage period of 24 months neither blue stain, nor red stripes, nor growth of Armillariella species could be detected. The bending strengths measured to DIN 52186 were not lower than those for green comparison samples (compare Fig. 5).

Example of embodiment 2

1 m³ of pine timber was enveloped with double dualene film, as in Fig. 2. Both film edges were clamped between strips and tightly wound around these strips. The composite thereby produced was secured from unwinding using clips. In this way, the conditions for adjustment of the gas atmosphere can be created without any weld seam using means available on the site.

Example of embodiment 3

According to Fig. 3, a maple veneer trunk of 35 cm centre diameter, 3 m length, was wrapped in double-layered dualene film. Near to either butt end of the trunk, a bulkhead fitting is attached. Then the films were doubly welded. After 2 weeks an atmosphere has established that contains less than 0.1% oxygen and whose carbon dioxide content is up to 30%.

Example of embodiment 4

In order to make overseas transportation possible of green round wood without damage, the wood is stacked in airtight-sealed holds, filling the hold space as completely as possible. As the holds can already be sealed water-tightly using bulkheads, sealing from air needs be produced only on the top using air-tight or sealed hatches. In order to reduce the adjustment time, exhaust gases of the ship's diesel engine are piped to the hold as initial fumigation.

## Claims

1. Method for preservation storage of green round wood and sawn timber in which
   - green round wood or sawn timber is stocked under an air-tight and light-tight cover,
   - oxygen inside said cover is digested by respiratory and fermentation processes performed by fungi, bacteria, and respiratory processes of wood cells that are still alive thereby forming $CO_2$, $H_2O$ and organic acids whereby, essentially, hemicelluloses and sugars are metabolized,
   - thus, the oxygen content inside the cover is less than 0.1 vol.-% after an adjustment period of 3–10 days during the entire storage time, and the $CO_2$ content is higher than 21 and up to 40 vol.-%.

2. Method to Claim 1 in which, in order to reduce the adjustment time, the $CO_2$ content is adjusted to be over 21 vol.-% immediately after the beginning of the storage by means of an additional fumigation with $CO_2$.

3. Method to Claim 1 or 2 in which before the beginning of the respiratory and fermentation processes, the volume of air inside the cover is minimized.

4. Method to Claim 1 to 3 in which a rigid or flexible envelope is used as cover, whereby the space inside the cover is sealed air-tightly and light-tightly from the environment.

5. Method to Claim 1 to 4 in which a single or double, UV-resistant plastic film with a high diffusion resistance is used as the cover.

6. Method to Claim 1 in which a single or double, two-layered film is used whose black internal surface prevents the light from entering and thereby growth of algae, and whose white external surface reflects the sunlight.

7. Method to Claim 5 or 6 in which the films are welded either separately or simultaneously with double welds.

8. Method to Claim 5 or 6 in which the films are bonded with each other.

9. Method to Claim 5 and 6 in which the films are arranged plane on top of each other, clamped between two strips, tightly wrapped around said strips, and secured using a clamping device.

10. Method to Claim 1 to 9 in which gas measuring flexible tubes that penetrate the films are attached to the films using bulkhead fittings.

11. Method to Claim 4 or 10 in which the bulkhead fittings are provided with extension hoses inside the cover, and the hose ends are laid showing to opposing sides of the space inside the cover.

12. Method to Claim 11 in which measuring instruments are connected to the gas measuring flexible tubes through quick-connect couplings, with which measuring instruments the storage process can be checked via the gas composition.

13. Method to Claim 4 in which containers or holds are used as rigid encapsulations.

14. Method to Claim 13 in which the containers or holds are supplied with exhaust gases from the combustion processes of the transportation means, or stationary plant, respectively.

## ABSTRACT

The invention relates to a method for stocking and preserving green round wood and sawn timber, which is stored in an airtight and lighttight sealing cover. The oxygen inside the cover is decomposed by the respiratory process of mushrooms, bacteria and wood cells that are still alive, thereby forming $CO_2$ and $H_2O$. Fermentation processes also lead to the decomposition of hemicelluloses and saccharides which are converted to organic acids and $CO_2$. The oxygen content in the cover is less than 0.1 vol. % after an adjustment time of 3 to 10 days of total stocking, while said $CO_2$ content rises to more than 21 and up to 40 vol. %. This method enables green round wood and sawn timber to be stocked over long periods without wastage or environmental damage.

Fig. 1

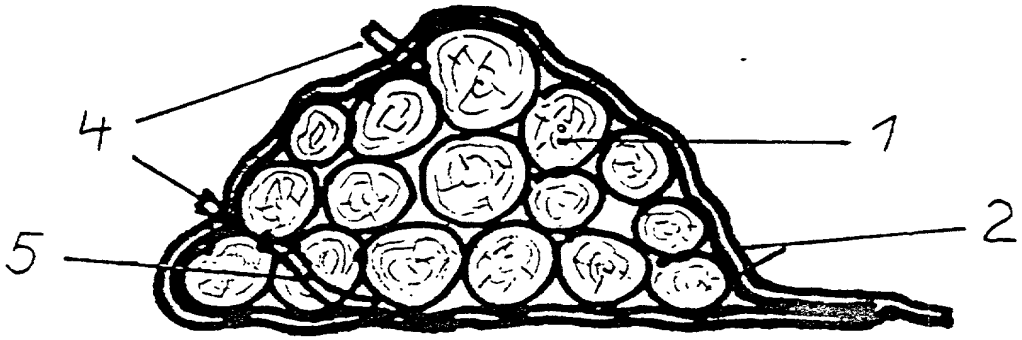



Fig. 2

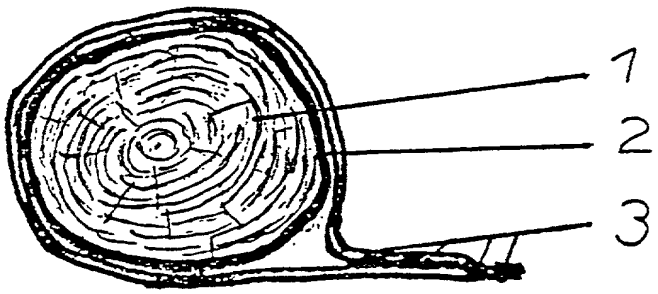
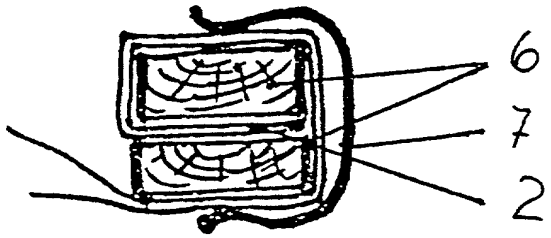



Fig. 3



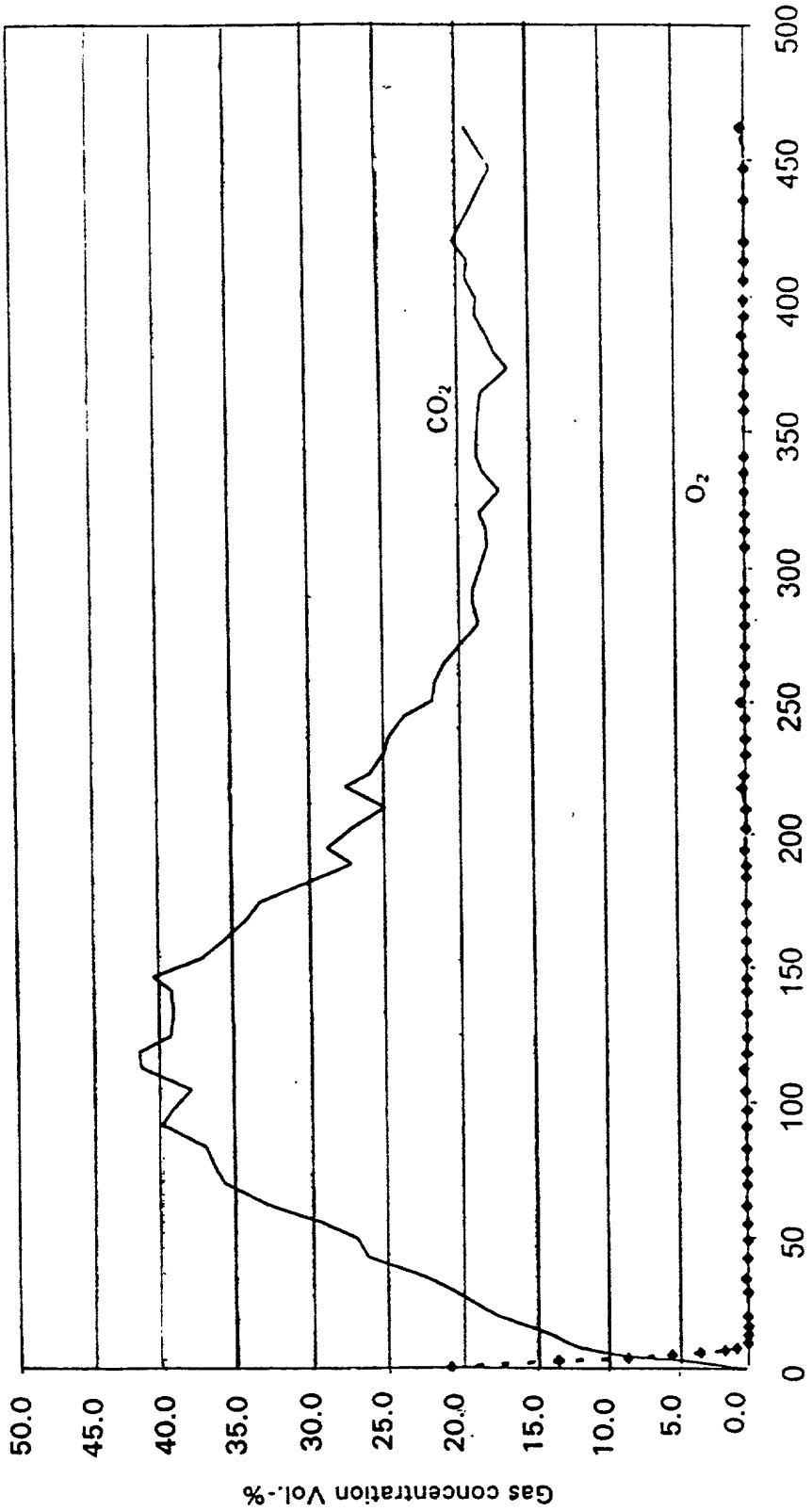

Gas concentration Vol.-%
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0
50
100
150
200
250
300
350
400
450
500
Storage time in days
$CO_2$
$O_2$

Fig. 4

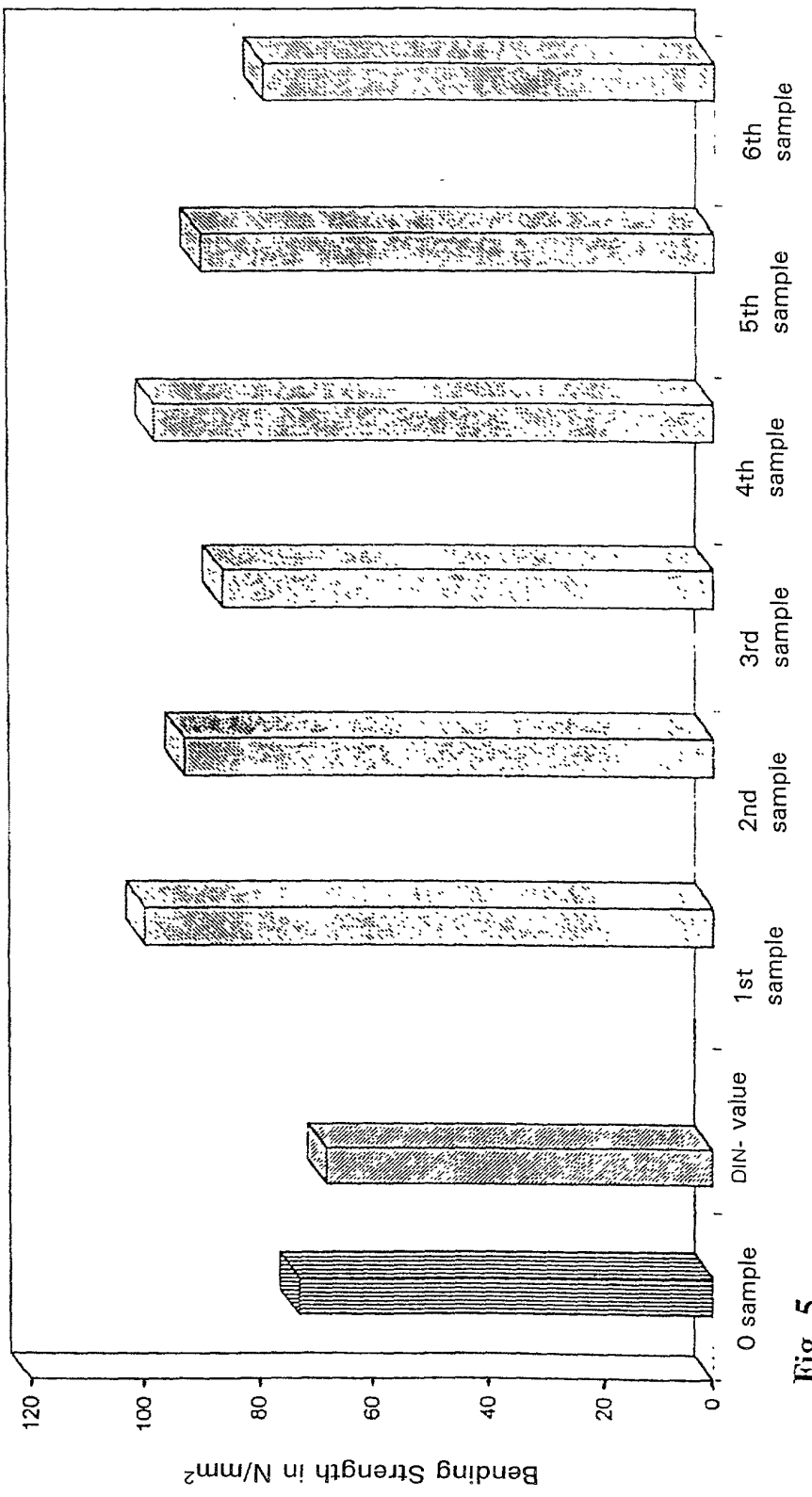

Bending Strength in N/mm²
0
20
40
60
80
100
120
O sample
DIN- value
1st sample
2nd sample
3rd sample
4th sample
5th sample
6th sample

Fig. 5

| COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (Includes Reference to PCT International Applications) | Attorney's Docket Number F-6224 |
|---|---|

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD FOR STOCKING AND PRESERVING GREEN ROUND WOOD AND SAWN TIMBER

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application

Serial No. _____

on _____ ,

and was amended

on _____ (if applicable).

[ X] was filed as PCT international application

Number PCT/DE97/02966 ,

on December 19, 1997

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

| PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119: | | | |
|---|---|---|---|
| Country (if PCT indicate "PCT") | Application Number | Date of Filing (day, month, year) | Priority Claimed Under 35 USC 119 |
| Germany | 196 52 951.4 | 19, December 1996 | [ X ] Yes [ ] No |
| | | | [ ] Yes [ ] No |
| | | | [ ] Yes [ ] No |
| | | | [ ] Yes [ ] No |
| | | | [ ] Yes [ ] No |

| COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (Continued) (Includes Reference to PCT International Applications) | Attorney's Docket Number F-6224 |
|---|---|

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

| U.S. APPLICATIONS | | STATUS (Check One) | | |
|---|---|---|---|---|
| U.S. Application Number | U. S. Filing Date | Patented | Pending | Abandoned |
| | | | | |
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| PCT APPLICATIONS DESIGNATING THE U.S. | | | | |
| PCT Application No. | PCT Filing Date | U.S. Serial Numbers Assigned (if any) | | |
| | | | | |
| | | | | |
| | | | | |

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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| Full Name of Seventh Joint Inventor | Inventor's Signature | Date |
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| Residence | | Citizenship |
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| Post Office Address | | |
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| Full Name of Eighth Joint Inventor | Inventor's Signature | Date |
|---|---|---|
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| Residence | | Citizenship |
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| Post Office Address | | |
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